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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Application Number: 10/540,866  
Filing Date: June 27, 2005  
Appellant(s): MATSUMURA ET AL.

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Heribert F. Muensterer  
For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed September 18, 2008 appealing from the  
Office action mailed March 21, 2008.

**(1) Real Party in Interest**

A statement identifying by name the real party in interest is contained in the brief.

**(2) Related Appeals and Interferences**

The following are the related appeals, interferences, and judicial proceedings known to the examiner which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal:

Co-pending Application No. 10/541,391

**(3) Status of Claims**

The statement of the status of claims contained in the brief is correct.

**(4) Status of Amendments After Final**

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

**(5) Summary of Claimed Subject Matter**

The summary of claimed subject matter contained in the brief is deficient. 37 CFR 41.37(c)(1)(v) requires the summary of claimed subject matter to include: (1) a concise explanation of the subject matter defined in each of the independent claims involved in the appeal, referring to the specification by page and line number, and to the drawing, if any, by reference characters and (2) for each independent claim involved in the appeal **and for each dependent claim argued separately**, every means plus function and step plus function as permitted by 35 U.S.C. 112, sixth paragraph, must be identified and the structure, material, or acts described in the specification as corresponding to each claimed function must be set forth with reference to the specification by page and line number, and to the drawing, if any, by reference

characters. The brief is deficient because dependent claims 2, 7, 12, 15, 4, 6, 11, 14, 8, 13, 16, 9, and 10, which have been argued separately, have not been summarized.

The claimed subject matter for claim 2 is the method according to claim 1, wherein the amount of styrene-based monomer is 50 to 300 parts by weight **[page 19, lines 1 - 3]**.

The claimed subject matter for claim 2 is the method according to claim 1, wherein the amount of styrene-based monomer is 50 to 300 parts by weight **[page 19, lines 1 - 3]**.

The claimed subject matter for claim 7 is expandable beads of a styrene-modified linear low-density polyethylene-based resin obtained by the method according to claim 2 **[page 19, lines 1 - 7]**.

The claimed subject matter for claim 15 is an expanded molded article having a density of 20 to 200 kg/m<sup>3</sup> obtained by expansion molding the beads of claim 12 **[page 21, lines 21 – 24 and page 22, lines 2 - 8]**.

The claimed subject matter for claim 4 is the method according to claim 1, wherein the low-density polyethylene-based resin beads have a spherical or cylindrical shape with a length/diameter ratio of 0.6 to 1.6 and an average bead size of 0.2 to 1.5 mm **[page 13, lines 4 - 8]**.

The claimed subject matter for claim 6 is expandable beads of a styrene-modified linear low-density polyethylene-based resin obtained by the method according to claim 2 **[page 18, lines 20 - 21]**.

The claimed subject matter for claim 11 is pre-expanded beads having a bulk density of 20 to 200 kg/m<sup>3</sup> obtained by pre-expanding the expandable beads of claim 6 **[page 21, lines 21 - 24]**.

The claimed subject matter for claim 14 is an expanded molded article having a density of 20 to 200 kg/m<sup>3</sup> obtained by expansion molding the beads of claim 11 **[page 21, lines 21 – 24 and page 22, lines 2 - 8]**.

The claimed subject matter for claim 8 is expandable beads of a styrene-modified linear low-density polyethylene-based resin obtained by the method according to claim 3 **[page 18, lines 20 - 21]**.

The claimed subject matter for claim 13 is pre-expanded beads having a bulk density of 20 to 200 kg/m<sup>3</sup> obtained by pre-expanding the expandable beads of claim 8 **[page 21, lines 21 - 24]**.

The claimed subject matter for claim 16 is an expanded molded article having a density of 20 to 200 kg/m<sup>3</sup> obtained by expansion molding the beads of claim 13 **[page 21, lines 21 – 24 and page 22, lines 2 - 8]**.

The claimed subject matter for claim 9 is pre-expanded beads having a bulk density of 20 to 200 kg/m<sup>3</sup> obtained by pre-expanding the expandable beads of claim 3 **[page 21, lines 21 - 24]**.

The claimed subject matter for claim 10 is an expanded molded article having a density of 20 to 200 kg/m<sup>3</sup> obtained by expansion molding the beads of claim 9 **[page 21, lines 21 – 24 and page 22, lines 2 - 8]**.

#### **(6) Grounds of Rejection to be Reviewed on Appeal**

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

#### **(7) Claims Appendix**

The copy of the appealed claims contained in the Appendix to the brief is correct.

### **(8) Evidence Relied Upon**

JP Publication No. 01-284536 to Takamasa et al., when considered with applicant's admitted prior art in the instant specification

3,963,816	SMITH	6-1976
4,368,218	SENDA et al.	1-1983
6,608,150	WICHER et al.	8-2003

### **(9) Grounds of Rejection**

The following ground(s) of rejection are applicable to the appealed claims:

**Claims 1, 2, 6, and 7** are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 1-284536 to Takamasa et al. (Patent Family 2668384) when considered with applicants' admitted prior art in the instant specification.

**Regarding claims 1, 2, 7, and 6.** Takamasa et al. teach a method for producing expandable particles/beads of a vinyl aromatic-modified (i.e. styrene-modified) polyethylene-based resin (English-language Abstract, Lines 1-3).

The applicants' admitted prior art in the instant specification provides evidence that Takamasa et al. use a non-crosslinked linear low-density polyethylene. Furthermore, the composition of the polyethylene-based resin is 100 parts by weight of non-crosslinked linear low-density polyethylene-based resin beads, 5 to 300 parts by weight of a vinyl aromatic monomer (e.g. styrene-based monomer), 1 to 3 parts by weight of a polymerization initiator relative to 100 parts by weight of the vinyl aromatic monomer. These ingredients are dispersed in an aqueous medium to obtain a dispersion (Instant Specification: Page 2, Lines 21 – 25 - Page 3, Lines 1 – 6). In the English-language abstract, Takamasa et al. state that a suspending agent such may also be dispersed in the aqueous medium (Lines 5 – 8), thereby rendering this aqueous medium a suspension.

While Takamasa et al. do not teach the claimed amount of polymerization initiator, the experimental modification of this prior art in order to ascertain optimum operating conditions fails to render applicants' claims patentable in the absence of unexpected results. *In re Aller*, 105 USPQ 233. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to optimize the amount of polymerization initiator used so that the desirable degree of polymerization (or gel content) is obtained. A prima facie case of obviousness may be rebutted, however, where the results of the optimizing variable, which is known to be result-effective, are unexpectedly good. *In re Boesch and Slaney*, 205 USPQ 215.

The dispersion formed is heated at a temperature such that the vinyl aromatic (e.g. styrene) monomer is infiltrated/impregnated into the polyethylene resin particles/beads but polymerization of the monomer does not substantially occur (English-language Abstract, Lines 9 – 11).

The applicants' admitted prior art in the instant specification also provides evidence that Takamasa et al. use linear low-density polyethylene-based resin beads with a melting point of 122°C (Instant Specification: Page 3, Lines 22 – 25). The polymerization of the vinyl aromatic (e.g. styrene) monomer is performed at a temperature of 115°C.

Takamasa et al. disclose that the particles are impregnated with a volatile blowing agent during or after the polymerization (English-language Abstract, Lines 12 – 13).

The applicants' admitted prior art in the instant specification further provides evidence that the resin components of the expandable beads of Takamasa et al. contain a gel component comprising the graft polymer of polystyrene on the polyethylene chain (Page 4, Lines 4 – 12). However, the specific percentage weight of the gel component

comprising the graft polymer when a polymerization initiator is used in the claimed amount is not disclosed. Consequently, the Office realizes that all of the claimed effects or physical properties are not positively stated by the reference(s). However, the reference(s) teaches all of the claimed ingredient(s), and process limitation(s).

Therefore, the claimed effects and physical properties, i.e. a gel component comprising less than 2 wt% of a graft polymer, would intrinsically be achieved by a composition with all the claimed ingredients. If it is the applicant's position that this would not be the case: (1) evidence would need to be provided to support the applicant's position; and (2) it would be the Office's position that the application contains inadequate disclosure that there is no teaching as to how to obtain the claimed properties with only the claimed ingredients.

**Claims 12 and 15** are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 1-284536 to Takamasa et al. (Patent Family 2668384) and the applicants' admitted prior art as applied to claims 1, 2, and 7 above, and further in view of US 3,963,816 to Smith et al.

Takamasa et al. teach the expandable beads of styrene-modified linear low-density polyethylene-based resin as indicated in the discussion of claims 1, 2, and 7.

**Regarding claims 12 and 15.** In view of the applicants' admitted prior art in the instant specification, Takamasa et al. teach an expanded molded article derived from the aforementioned expandable beads (Page 2, Lines 21 – 24). Takamasa et al. do not expressly indicate a method of obtaining this expanded molded article by pre-expanding the expandable beads. However, Smith et al. do teach an expanded molded article derived from pre-expanded beads. These beads are made by pre-expanding expandable beads of polyethylene and/or styrene (Column 3, Lines 1 – 18 and Column

4, Lines 3 – 12). Takamasa et al. and Smith et al. are combinable because they are from the same field of endeavor, namely expandable resin beads containing polyethylene and styrene. At the time of invention, it would have been obvious to a person of ordinary skill in the art to pre-expand the resin beads, as taught by Smith et al., to obtain the expanded molded article taught by Takamasa et al. The motivation would have been that pre-expanding the beads allows one to control the density of the final product, which, in this case, is an expanded molded article.

**Claim 4** is rejected under 35 U.S.C. 103(a) as being unpatentable over JP 1-284536 to Takamasa et al. (Patent Family 2668384) and the applicants' admitted prior art as applied to claim 1 above, and further in view of US 4,368,218 to Senda et al.

Takamasa et al. teach a method of producing expandable beads of a vinyl aromatic-modified (i.e. styrene-modified) polyethylene-based resin as described in Claim 1.

**Regarding claim 4.** Takamasa et al. do not specify a shape for the expandable beads produced by their method. However, Senda et al. also teach a method of making expandable thermoplastic polymer beads in which a core of vinyl monomer (e.g. styrene) is surround by a layer of polyolefin (e.g. polyethylene). The expandable thermoplastic polymer beads generally have a spherical or ellipsoidal form/shape and range from 400 to 8000 microns (0.4 to 8.0 mm) in size (Column 4, Lines 30 – 34). Takamasa et al. and Senda et al. are analogous art because they are from the same field of endeavor, namely expandable polyethylene beads. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to form spherically shaped resin beads from the product of the method disclosed by Takamasa et al. The

motivation would have been that electing a spherical shape for the resin bead would improve upon its expansion ratio, heat resistance, and mechanical properties.

**Claims 11 and 14** are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 1-284536 to Takamasa et al. (Patent Family 2668384) and the applicants' admitted prior art as applied to claims 1 and 6 above, and further in view of US 3,963,816 to Smith et al.

Takamasa et al. teach the expandable beads of styrene-modified linear low-density polyethylene-based resin as indicated in the discussion of Claims 1 and 6 above.

**Regarding claims 11 and 14.** In view of the applicants' admitted prior art in the instant specification, Takamasa et al. teach an expanded molded article derived from the aforementioned expandable beads (Page 2, Lines 21 – 24). Takamasa et al. do not expressly indicate a method of obtaining this expanded molded article by pre-expanding the expandable beads. However, Smith et al. do teach an expanded molded article derived from pre-expanded beads. These beads are made by pre-expanding expandable beads of polyethylene and/or styrene (Column 3, Lines 1 – 18 and Column 4, Lines 3 – 12). Takamasa et al. and Smith et al. are combinable because they are from the same field of endeavor, namely expandable resin beads containing polyethylene and styrene. At the time of invention, it would have been obvious to a person of ordinary skill in the art to pre-expand the resin beads, as taught by Smith et al., to obtain the expanded molded article taught by Takamasa et al. The motivation would have been that pre-expanding the beads allows one to control the density of the final product, which, in this case, is an expanded molded article.

**Claims 3 and 8** are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 1 284536 to Takamasa et al. (Patent Family 2668384) and the applicants' admitted prior art in view of US 6,608,150 to Wicher et al.

**Regarding claims 3 and 8.** Takamasa et al. teach a method for producing expandable particles/beads of a vinyl aromatic-modified (i.e. styrene-modified) polyethylene-based resin (English-language Abstract, Lines 1-3).

In view of the applicants' admitted prior art in the instant specification, Takamasa et al. indicate that the polyethylene used is non-crosslinked linear low-density polyethylene. Furthermore, the composition of the polyethylene-based resin is 100 parts by weight of non-crosslinked linear low-density polyethylene-based resin beads, 5 to 300 parts by weight of a vinyl aromatic monomer (e.g. styrene-based monomer), 1 to 3 parts by weight of a polymerization initiator relative to 100 parts by weight of the vinyl aromatic monomer. These ingredients are dispersed in an aqueous medium to obtain a dispersion (Instant Specification: Page 2, Lines 21 – 25 - Page 3, Lines 1 – 6). In the English-language abstract, Takamasa et al. state that a suspending agent such may also be dispersed in the aqueous medium (Lines 5 – 8), thereby rendering this aqueous medium a suspension.

The dispersion formed is heated at a temperature such that the vinyl aromatic (e.g. styrene) monomer is infiltrated/impregnated into the polyethylene resin particles/beads but polymerization of the monomer does not substantially occur (English-language Abstract, Lines 9 – 11).

In view of the applicants' admitted prior art in the instant specification, Takamasa et al. use linear low-density polyethylene-based resin beads with a melting

point of 122°C (Instant Specification: Page 3, Lines 22 – 25). The polymerization of the vinyl aromatic (e.g. styrene) monomer is performed at a temperature of 115°C.

Takamasa et al. do not disclose a second polymerization in their method for producing expandable beads. However, Wicher et al. teach a step-wise process for polymerizing styrene monomer using two different temperature stages. A polymerizing initiator such as organic peroxide is used in the final polymerization step preferably in an amount from 0.002 to 0.006 equivalents of peroxide initiator per liter of styrene (Column 6, Lines 54 – 59). During the second polymerization, the suspension is heated at a temperature of between 110 and 115°C (see Examples). Takamasa et al. and Wicher et al. are analogous art because they encompass the same field of endeavor, namely the suspension polymerization process of styrene monomer. At the time of invention, it would have been obvious to a person of ordinary skill in the art to include an additional polymerization step in the process described by Takamasa et al. The motivation would have been that an additional polymerization step would be to provide for a more complete polymerization of styrene, thereby reducing monomer content to acceptable levels for commercial processing.

In the polymerization step disclosed by Takamasa et al., the total amount of vinyl aromatic (e.g. styrene) monomer used is 5 to 300 parts by weight relative to 100 parts by weight of the low-density polyethylene-based resin beads.

Takamasa et al. furthermore disclose that the particles are impregnated with a volatile blowing agent during or after the polymerization (English-language Abstract, Lines 12 – 13).

In view of the applicants' admitted prior art in the instant specification, the resin components of the expandable beads contain a gel component comprising the graft polymer of polystyrene on the polyethylene chain (Page 4, Lines 4 - 12), though what

specific percentage weight of the gel component is comprised by the graft polymer is not disclosed by Takamasa et al. Consequently, the Office realizes that all of the claimed effects or physical properties are not positively stated by the reference(s). However, the reference(s) teaches all of the claimed ingredient(s), and process limitation(s). Therefore, the claimed effects and physical properties, i.e. a gel component comprising less than 2 wt% of a graft polymer, would implicitly be achieved by a composition with all the claimed ingredients. If it is the applicant's position that this would not be the case: (1) evidence would need to be provided to support the applicant's position; and (2) it would be the Office's position that the application contains inadequate disclosure that there is no teaching as to how to obtain the claimed properties with only the claimed ingredients.

**Claims 13 and 16** are rejected under 35 U.S.C. 103(a) as being unpatentable over are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 1-284536 to Takamasa et al. (Patent Family 2668384) and the applicants' admitted prior art in view of US 6,608,150 to Wicher et al. as applied to claims 3 and 8 above, and further in view of US 3,963,816 to Smith et al.

Takamasa et al., in view of the applicants' admitted prior art and Wicher et al., teach the expandable beads of styrene-modified linear low-density polyethylene-based resin as indicated in the discussion of claims 3 and 8.

**Regarding claims 13 and 16.** In view of the applicants' admitted prior art in the instant specification, Takamasa et al. teach an expanded molded article derived from the aforementioned expandable beads (Page 2, Lines 21 – 24). Takamasa et al. do not expressly indicate a method of obtaining this expanded molded article by pre-expanding the expandable beads. However, Smith et al. do teach an expanded molded

article derived from pre-expanded beads. These beads are made by pre-expanding expandable beads of polyethylene and/or styrene (Column 3, Lines 1 – 18 and Column 4, Lines 3 – 12). Takamasa et al. and Smith et al. are combinable because they are from the same field of endeavor, namely expandable resin beads containing polyethylene and styrene. At the time of invention, it would have been obvious to a person of ordinary skill in the art to pre-expand the resin beads, as taught by Smith et al., to obtain the expanded molded article taught by Takamasa et al. The motivation would have been that pre-expanding the beads allows one to control the density of the final product, which, in this case, is an expanded molded article.

**Claim 5** is rejected under 35 U.S.C. 103(a) as being unpatentable over JP 1-284536 to Takamasa et al. (Patent Family 2668384) when considered with applicants' admitted prior art in the instant specification.

**Regarding claim 5.** Takamasa et al. disclose expandable beads of a styrene-modified linear low-density polyethylene-based resin, which contain a volatile blowing agent (English-language Abstract, Lines 1- 3 and 12 – 13). The beads also contain a base resin that is 5 to 300 parts by weight of a vinyl aromatic monomer (e.g. styrene-based monomer) and 1 to 3 parts by weight of a polymerization initiator relative to 100 parts by weight of non-crosslinked linear low-density polyethylene-based resin. However, the experimental modification of this prior art in order to ascertain optimum operating conditions fails to render applicants' claims patentable in the absence of unexpected results. *In re Aller*, 105 USPQ 233. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to optimize the amount of polymerization initiator used so that the desirable degree of polymerization (or gel content) is obtained. A prima facie case of obviousness may be rebutted, however,

where the results of the optimizing variable, which is known to be result-effective, are unexpectedly good. *In re Boesch and Slaney*, 205 USPQ 215.

The applicants' admitted prior art in the instant specification provides evidence that the resin components of the expandable beads of Takamasa et al. contain a gel component comprising the graft polymer of polystyrene on the polyethylene chain (Page 3, Lines 13 – 25), though the specific percentage weight of the gel component comprising the graft polymer is not disclosed. Consequently, the Office realizes that all of the claimed effects or physical properties are not positively stated by the reference(s). However, the reference(s) teaches all of the claimed ingredient(s), and process limitation(s). Therefore, the claimed effects and physical properties, i.e. a gel component comprising less than 2 wt% of a graft polymer, would implicitly be achieved by a composition with all the claimed ingredients. If it is the applicant's position that this would not be the case: (1) evidence would need to be provided to support the applicant's position; and (2) it would be the Office's position that the application contains inadequate disclosure that there is no teaching as to how to obtain the claimed properties with only the claimed ingredients.

**Claims 9 and 10** are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 1-284536 to Takamasa et al. (Patent Family 2668384) and the applicants' admitted prior art as applied to claim 5 above, and further in view of US 3,963,816 to Smith et al.

Takamasa et al. teach the expandable beads of styrene-modified linear low-density polyethylene-based resin as indicated in the discussion of Claims 5.

**Regarding claims 9 and 10.** In view of the applicants' admitted prior art in the instant specification, Takamasa et al. teach an expanded molded article derived from the aforementioned expandable beads (Page 2, Lines 21 – 24). Takamasa et al. do not

expressly indicate a method of obtaining this expanded molded article by pre-expanding the expandable beads. However, Smith et al. do teach an expanded molded article derived from pre-expanded beads. These beads are made by pre-expanding expandable beads of polyethylene and/or styrene (Column 3, Lines 1 – 18 and Column 4, Lines 3 – 12). Takamasa et al. and Smith et al. are combinable because they are from the same field of endeavor, namely expandable resin beads containing polyethylene and styrene. At the time of invention, it would have been obvious to a person of ordinary skill in the art to pre-expand the resin beads, as taught by Smith et al., to obtain the expanded molded article taught by Takamasa et al. The motivation would have been that pre-expanding the beads allows one to control the density of the final product, which, in this case, is an expanded molded article.

**Claims 1 - 16** are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1 and 3 - 9 of copending Application No. 10/541,391. Although the conflicting claims are not identical, they are not patentably distinct from each other because the claims are obvious variations upon each other. The claimed methods and products made appear to be modifications of each other derived from routine experimentation and optimization, such as in the case of the closely related polymerization temperature ranges indicated in either set of claims.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

**Regarding claims 1 - 3.** Current claims 1 - 3 correspond to claim 1 of Application No. 10/541,391.

**Regarding claim 4.** Current claim 4 corresponds to claim 3 of Application No. 10/541,391.

**Regarding claim 5.** Current claim 5 corresponds to claim 4 of Application No. 10/541,391.

**Regarding claims 6 - 8.** Current claims 6 - 8 correspond to claim 5 of Application No. 10/541,391.

**Regarding claim 9.** Current claim 9 corresponds to claim 6 of Application No. 10/541,391.

**Regarding claim 10.** Current Claim 10 corresponds to Claim 7 of Application No. 10/541,391.

**Regarding claims 11 - 13.** Current claims 11 - 13 correspond to claim 8 of Application No. 10/541,391.

**Regarding claims 14 - 16.** Current claims 14 - 16 correspond to claim 9 of Application No. 10/541,391.

## **(10) Response to Argument**

### **A. Citation of Authority**

The Office agrees that the decisions set forth in *Graham v. John Deer Co.* and *KSR Int'l Co. v. Teleflex Inc.* provide standards for determining obviousness.

**B. Regarding the rejection of claims 1, 2, 6, and 7 under 35 U.S.C. 103(a) as obvious over Takamasa et al. in view of appellant's admitted prior art in the instant specification**

#### **1. Appellant's Summary of Rejection of Claims 1, 2, 6, and 7**

This section summarizes the rejections of claims 1, 2, 6, and 7 set forth in pages 6 – 9 of the current Examiner's Answer. Regarding appellant's assertion that no reason was provided to use an amount of initiator outside the range taught by Takamasa et al., motivation to modify the amount of initiator was clearly stated in the rejection of the claims (see page 7, first full paragraph of the current Examiner's answer).

**2a. The claimed polymerization temperature is obvious over Takamasa et al.**

Appellant argues the polymerization temperature must be within the claimed range to achieve the claimed gel fraction of less than 2 wt.% in the expandable resin beads.

Takamasa et al. use linear low-density polyethylene-based resin beads with a melting point of 122°C (Instant Specification: Page 3, Lines 22 – 25). The polymerization of the vinyl aromatic (e.g. styrene) monomer is performed at a temperature of 115°C. The instant claims set forth a polymerization temperature in the range of (T-15) to (T-8) or (T+1) to (T+5) where T is the melting point in degrees Celsius of the polyethylene-based resin beads. Takamasa et al. teach a polymerization temperature that would be defined by appellant's claims as T-7, thus falling outside of the claimed range.

However, a *prima facie* case of obviousness exists where the claimed ranges and prior art do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985) (MPEP 2144.05). The thermal history of a specific polyethylene composition – the temperatures to which the composition has been exposed and periods of time over which the composition has been exposed to these temperatures - can cause fluctuations in its melting point. The melting point of the polyethylene beads will accordingly vary batch by batch. Additionally, even

though a temperature for carrying out polymerization is chosen, it is to be expected that the temperature during which polymerization is actually carried out under normal processing conditions will experience small variations above and below the chosen temperature. Depending upon the polyethylene used and the processing conditions, it is possible that, in the practice of carrying out the process according to Takamasa et al., the polymerization temperature may fluctuate above  $T - 7$  and even close to  $T - 8$ . As such, the polymerization temperatures taught by Takamasa et al. and in the upper part of the claimed range of  $(T+15)$  to  $(T-8)$  are close enough that they would be expected to produce products with the same properties, such as gel content. It is thus the Office's position that the claimed polymerization temperatures, specifically those in the upper part of the range of  $(T+15)$  to  $(T-8)$ , are close enough to that taught by Takamasa et al. that they are obvious in view of Takamasa et al.

Appellant cites Example 13 and corresponding Table 5 to show polymerization temperatures outside the claimed range will not produce a gel content in the claimed range. However, the evidence provided is insufficient to support this assertion because it is not commensurate in scope with the instant claims. In addition to incrementally increasing the polymerization temperature, different polymerization initiators are used at different temperatures. A specific polymerization initiator is not a limitation set forth in the instant claims. With two changing variables, polymerization temperature and type of initiator, it would be improper to assume the gel content is a function of polymerization temperature alone. Even if the initiator was held constant, as indicated above, the actual practice of the process according to Takamasa et al. may experience polymerization temperature fluctuations above  $T - 7$ . However, appellant has provided no data showing unexpected results between  $T-8$  and  $T-7$  (in Example 13, respectively  $118^{\circ}\text{C}$  and  $119^{\circ}\text{C}$ ). Additionally, Example 13 shows the specific polymerization

temperature taught by Takamasa et al. (115°C) produces a gel content in the claimed range.

Appellant cites Examples 1 and 4 and Comparative Examples 2 - 7 as further evidence to show polymerization temperatures outside the claimed range will not produce a gel content in the claimed range. In Example 1, the polymerization temperature can be defined as T-9. In Example 4, a different polymerization initiator than in Example 1 is used but the polymerization temperature is the same. As stated above, the evidence is not commensurate in scope with the instant claims because a specific polymerization initiator is not a limitation set forth in the instant claims. A comparison of Examples 1 and 4 suggests more about influence of the initiator used on gel content rather than the polymerization temperature.

Comparative Example 2 is performed using the same method as Example 1, except that the temperature is raised to T-7 (as in the Takamasa et al. reference). However, the actual practice of the process according to Takamasa et al. may experience polymerization temperature fluctuations above T - 7. However, appellant has provided no data showing unexpected results between T-9 and T-7. The Office thus maintains the position that carrying out the process taught by Takamasa et al. could be reasonably expected to produce beads with a gel content in the claimed range.

Comparative Examples 3, 4, 5, 6, and 7 are also performed using the same method as Example 1 except that they are carried out respectively at polymerization temperatures of T-5, T-4, T-3, T-1, and T+9. These examples are also insufficient evidence to prove the gel content of the beads produced according to Takamasa et al. would not be in the claimed range, as none of the polymerization temperatures used is the temperature disclosed by Takamasa et al.

**2b. The claimed amount of polymerization initiator is obvious over Takamasa et al.**

Appellant argues that a comparison of the results in Comparative Example 2 with those of Comparative Examples 8 and 9 shows the amount of initiator is critical for obtaining beads with satisfactory strength properties. However, this showing of unexpected results is not commensurate in scope with the instant claims. None of the examples cited to prove the criticality of amount of initiator are prepared in accordance with the method set forth in the instant claims: all are carried out at polymerization temperatures outside the claimed range. Even if one of the examples were prepared in accordance with the instant claims, two variables - polymerization temperature and amount of initiator – are being changed. It would thus be improper to assume the strength of the beads is a function of the amount of initiator used alone.

**2c. The claimed polymerization temperature and amount of initiator are obvious over Takamasa et al.**

Appellant argues that Takamasa et al. does not teach or suggest the effect of the polymerization temperature on gel fraction. However, it is the Office's position that the claimed polymerization temperatures, specifically those in the upper part of the range of (T+15) to (T-8), are close enough to that taught by Takamasa et al. that they are obvious in view of Takamasa et al. As appellant has indicated that the gel content is strongly dependent upon the specific reaction conditions employed (remarks submitted November 26, 2007, Page 10, Paragraph 2), the Office consequently submits a gel content in the claimed range can be reasonably assumed to be achieved by carrying out the method disclosed by Takamasa et al.

Appellant additionally argues that Takamasa et al. do not teach using an amount of initiator in the claimed range of 0.1 to 0.9 parts by weight per 100 parts styrene

monomer. However, Takamasa et al. teach using 1 - 3 parts by weight per 100 parts styrene monomer. As asserted on page 7 of the current Examiner's answer, the experimental modification of this prior art in order to ascertain optimum operating conditions fails to render applicants' claims patentable in the absence of unexpected results. *In re Aller*, 105 USPQ 233. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to optimize the amount of polymerization initiator used so that the desirable degree of polymerization (or gel content) is obtained. Processing conditions are also routinely optimized for reasons such as cost and speed. A prima facie case of obviousness may be rebutted, however, where the results of the optimizing variable, which is known to be result-effective, are unexpectedly good. *In re Boesch and Slaney*, 205 USPQ 215.

Furthermore, a *prima facie* case of obviousness exists where the claimed ranges and prior art do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985) (MPEP 2144.05). As appellant has not provided sufficient evidence to refute the expectation that the claimed amount of polymerization initiator and the amount taught by Takamasa et al. are close enough to produce beads with similar gel content, the corresponding rejection under 35 U.S.C. 103(a) has been maintained.

#### **2d. Claims 2, 6, and 7**

Appellant argues that, because claims 2, 6, and 7 all depend from claim 1 and therefore all possess a gel content of less than 2 weight percent, they are not obvious in view of previous arguments. As indicated above, it is the Office's position that the two factors which appellant asserts are responsible for the obtaining the claimed gel content – the polymerization temperature and the amount of initiator – are obvious in view of

Takamasa et al. The claimed gel content would intrinsically be achieved in view of Takamasa et al. Accordingly, claims 2, 6, and 7 would likewise possess the claimed gel content and are maintained to be obvious in view of Takamasa et al.

**C. Regarding the rejection of claims 12 and 15 as obvious over Takamasa et al. in view of appellant's admitted prior art in the instant specification and Smith**

Appellant argues that, because claims 12 and 15 depend from claim 1 and therefore possess a gel content of less than 2 weight percent, they are not obvious in view of previous arguments. As indicated above, it is the Office's position that the two factors which appellant asserts are responsible for the obtaining the claimed gel content – the polymerization temperature and the amount of initiator – are obvious in view of Takamasa et al. The claimed gel content would intrinsically be achieved in view of Takamasa et al. Accordingly, claims 12 and 15 would likewise possess the claimed gel content and are maintained to be obvious in view of Takamasa et al.

**D. Regarding the rejection of claim 4 as obvious over Takamasa et al. in view of appellant's admitted prior art in the instant specification and Senda et al.**

Appellant argues that, because claim 4 depends from claim 1 and therefore possesses a gel content of less than 2 weight percent, it is not obvious in view of previous arguments. As indicated above, it is the Office's position that the two factors which appellant asserts are responsible for the obtaining the claimed gel content – the polymerization temperature and the amount of initiator – are obvious in view of Takamasa et al. The claimed gel content would intrinsically be achieved in view of Takamasa et al. Accordingly, claim 4 would likewise possess the claimed gel content and are maintained to be obvious in view of Takamasa et al.

Appellant additionally argues that the process for producing the expandable resin beads taught by Takamasa et al. is entirely different from that disclosed by Senda et al. However, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). The rejection of Claim 4 did not assert it would have been obvious to use the method of Senda et al. to produce the beads taught by Takamasa et al. Rather, the rejection indicated it would have been obvious to prepare the beads taught by Takamasa et al. with a spherical shape, as taught by Senda et al, to obtain beads with improved expansion ratio, heat resistance, and mechanical properties.

**E. Regarding the rejection of claims 11 and 14 as obvious over Takamasa et al. in view of appellant's admitted prior art in the instant specification and Smith**

Appellant argues that, because claims 11 and 14 depend from claim 1 and therefore possess a gel content of less than 2 weight percent, they are not obvious in view of previous arguments. As indicated above, it is the Office's position that the two factors which appellant asserts are responsible for the obtaining the claimed gel content – the polymerization temperature and the amount of initiator – are obvious in view of Takamasa et al. The claimed gel content would intrinsically be achieved in view of Takamasa et al. Accordingly, claims 11 and 14 would likewise possess the claimed gel content and are maintained to be obvious in view of Takamasa et al.

**F. Regarding the rejection of claims 3 and 8 as obvious over Takamasa et al. in view of appellant's admitted prior art in the instant specification and Wicher et al.**

**1. Appellant's Summary of Rejection of Claims 3 and 8**

This section summarizes the rejections of claims 3 and 8 set forth in pages 12 - 15 of the current Examiner's Answer.

**2a. The teachings of Takamasa et al. and Wicher et al. are combinable**

Appellant argues that, though both Takamasa et al. and Wicher et al. teach beads comprising polystyrene, their teachings are not combinable because: 1) Takamasa et al. teach pre-formed beads while Wicher et al. teach beads formed from scratch; 2) Takamasa et al. teach styrene-modified polyethylene beads while Wicher et al. teach polystyrene beads and 3) Wicher et al. teach using a different amount of polymerization initiator than Takamasa et al. However, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). The rejection of Claim 3 did not assert it would have been obvious to use the method of Wicher et al. to produce the *beads* taught by Takamasa et al. or to use the amount of initiator taught by Wicher et al. in the method taught by Takamasa et al. Rather, as both Takamasa et al. and Wicher et al. relate to polymerization of styrene monomers, Wicher et al. was relied upon as it teaches it would have been obvious to carry out the polymerization of styrene monomers taught by Takamasa et al. in two steps. The motivation to do so would have been that the two-step process provides advantages such as isolating the polymer beads and segregating them by size prior to a separate impregnation operation. This, in turn,

allows for more precise control of bead size which is critical in some polymer molding operations (Wicher et al.: Column 1, Lines 57 – 60).

**2b. Takamasa et al. teach the claimed polymerization temperature, amount of initiator, and gel content**

Appellant argues that the combination of Takamasa et al. and Wicher et al. does not arrive at the claimed invention because Takamasa et al. and Wicher et al. do not teach the claimed polymerization temperature, amount of initiator, and gel content. As indicated above, it is the Office's position that the two factors which appellant asserts are responsible for the obtaining the claimed gel content – the polymerization temperature and the amount of initiator – are obvious in view of Takamasa et al. The claimed gel content would intrinsically be achieved in view of Takamasa et al. Accordingly, claims 3 and 8 are maintained to be obvious in view of Takamasa et al.

**2c. Wicher et al. suggest conducting a multi-step polymerization in the method of Takamasa et al.**

Appellant argues Wicher et al. is not concerned with impregnation of the styrene monomer into an expandable resin and therefore provides no motivation for conducting the method taught by Takamasa et al. in two steps. However, Wicher et al. does provide motivation, as recited in section 2a of the current Examiner's answer.

**2d. Wicher et al. teach step-wise addition and polymerization of styrene-based monomer**

Appellant argues that the combination of Takamasa et al. and Wicher et al. would not lead to the claimed invention because the claimed method teaches adding styrene monomer, impregnating it into the bead, and then polymerizing it. These three steps are subsequently repeated. Appellant argues that Takamasa et al. teach only a one-step polymerization of the styrene monomer. Appellant also argues that Wicher et

al. teach a two-step polymerization process but only teach addition of the styrene monomer once and do not teach impregnation of the styrene monomer into a pre-formed bead.

In response, Wicher et al. do teach step-wise addition of styrene monomer (see Example 4) rather than adding all styrene monomer to be polymerized at the beginning of the process. The second addition of styrene monomer is followed by a second polymerization step. Furthermore, though Wicher et al. do not teach impregnating the styrene monomer into a polyethylene bead, it is submitted that such a step would be obvious to a person of ordinary skill in the art carrying out the process taught by Takamasa et al. with a two-step polymerization of styrene. Dividing the polymerization into two steps in the method taught by Takamasa et al. would necessarily mean carrying out the process of adding styrene monomer, impregnating it into the bead, and polymerizing it twice. After the first batch of styrene monomer is polymerized and the second batch is added, a person of ordinary skill in the art would be reasonably expected to once again impregnate the styrene monomer into the bead, as taught in the first step by Takamasa et al., so that the styrene-modified polyethylene bead could be formed.

## **2e. Claim 8**

Appellant argues that the combination of Takamasa et al. and Wicher et al. does not arrive at the claimed invention because Takamasa et al. and Wicher et al. do not teach the claimed polymerization conditions and gel content. As indicated above, it is the Office's position that the claimed process which appellant asserts is responsible for the obtaining the claimed gel content is obvious in view of Takamasa et al. and Wicher et al. The claimed gel content would then intrinsically be achieved in view of Takamasa

et al. and Wicher et al. Accordingly, claims 3 and 8 are maintained to be obvious in view of Takamasa et al. and Wicher et al.

**G. Regarding the rejection of claims 13 and 16 as obvious over Takamasa et al. in view of appellant's admitted prior art in the instant specification, Wicher et al., and Smith**

Appellant argues that the combination of Takamasa et al. and Wicher et al. does not arrive at the claimed invention because Takamasa et al. and Wicher et al. do not teach the claimed polymerization conditions and gel content. As indicated above, it is the Office's position that the claimed process which appellant asserts is responsible for the obtaining the claimed gel content is obvious in view of Takamasa et al. and Wicher et al. The claimed gel content would then intrinsically be achieved in view of Takamasa et al. and Wicher et al. Accordingly, claims 13 and 16 are maintained to be obvious in view of Takamasa et al., Wicher et al., and Smith.

**H. Regarding the rejection of claim 5 as obvious over Takamasa et al. in view of appellant's admitted prior art in the instant specification**

**1. Appellant's Summary of Rejection of Claim 5**

This section summarizes the rejections of claims 3 and 8 set forth in pages 12 - 15 of the current Examiner's Answer.

**2. The claimed polymerization temperature is obvious over Takamasa et al.**

Appellant argues Takamasa et al. do not teach a polymerization temperature in the claimed range.

Takamasa et al. use linear low-density polyethylene-based resin beads with a melting point of 122°C (Instant Specification: Page 3, Lines 22 – 25). The

polymerization of the vinyl aromatic (e.g. styrene) monomer is performed at a temperature of 115°C. The instant claims set forth a polymerization temperature in the range of (T-15) to (T-8) or (T+1) to (T+5) where T is the melting point in degrees Celsius of the polyethylene-based resin beads. Takamasa et al. teach a polymerization temperature that would be defined by appellant's claims as T-7, thus falling outside of the claimed range.

However, a *prima facie* case of obviousness exists where the claimed ranges and prior art do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985) (MPEP 2144.05). The thermal history of a specific polyethylene composition – the temperatures and periods of time over which the composition has been exposed to these temperatures - can cause fluctuations in its melting point. The melting point of the polyethylene will vary batch by batch. Additionally, even when a temperature for carrying out polymerization is chosen, it is to be expected that the temperature during which polymerization is actually carried out under normal processing conditions will experience small variations above and below the chose temperature. Depending upon the polyethylene used and the processing conditions, it is possible that, in the practice of carrying out the process according to Takamasa et al., the polymerization temperature may fluctuate above T – 7 and even close T – 8. As such, the polymerization temperatures taught by Takamasa et al. and in the upper part of the claimed range of (T+15) to (T-8) are close enough that they would be expected to produce products with the same properties, such as gel content. It is thus the Office's position that the claimed polymerization temperatures, specifically those in the upper part of the range of (T+15) to (T-8), are close enough to that taught by Takamasa et al. that they are obvious in view of Takamasa et al.

Appellant cites Example 13 and corresponding Table 5 to show polymerization temperatures outside the claimed range will not produce a gel content in the claimed range. However, the evidence provided is insufficient to support this assertion because it is not commensurate in scope with the instant claims. In addition to incrementally increasing the polymerization temperature, different polymerization initiators are used at different temperatures. A specific polymerization initiator is not a limitation set forth in the instant claims. With two changing variables, polymerization temperature and initiator, it would be improper to assume the gel content is a function of polymerization temperature alone. Even if the initiator was held constant, as indicated above, the actual practice of the process according to Takamasa et al. may experience polymerization temperature fluctuations above T – 7. However, appellant has provided no data showing unexpected results between T-8 and T-7 (in Example 13, respectively 118°C and 119°C). Additionally, Example 13 shows the specific polymerization temperature taught by Takamasa et al. (115°C) produces a gel content in the claimed range.

**I. Regarding the rejection of claims 9 and 10 as obvious over Takamasa et al. in view of appellant's admitted prior art in the instant specification and Smith**

Appellant argues that, because claims 9 and 10 depend from claim 5 and therefore all possess a gel content of less than 2 weight percent, they are not obvious in view of previous arguments. As indicated above, it is the Office's position that the two factors which appellant asserts are responsible for the obtaining the claimed gel content – the polymerization temperature and the amount of initiator – are obvious in view of Takamasa et al. The claimed gel content would intrinsically be achieved in view of

Takamasa et al. Accordingly, claims 9 and 10 would likewise possess the claimed gel content and are maintained to be obvious in view of Takamasa et al.

**J. Regarding the rejection of claims 1 - 16 on the ground of nonstatutory obviousness-type double patenting over claims 1 and 3 - 9 of Application No. 10/541,391**

**1. Appellant's summary of obviousness-type rejection of Claims 1 - 16**

This section summarizes the rejections of claims 1 - 16 set forth in pages 19 - 21 of the current Examiner's Answer. Regarding applicant's statement that no indication has been made regarding why the claims in the conflicting applications are obvious variations upon each other, the Office did set forth rationale for this determination (see page 20 of the current Examiner's Answer).

**2. Instant claims 1 – 16 and claims 1 and 3 – 9 of Application No. 10/541,391 are obvious variations upon each other**

Appellant argues the instant claims and claims of Application No. 10/541,391 are not obvious variations upon each other because they disclose different polymerization temperatures and gel contents. However, both ends of the polymerization temperature range of higher than T-8 to lower than T+1 disclosed in Application No. 10/541,391 are remarkably close to the upper end of the first range (T-8) in the instant claims and the lower end of the second range (T+1) in the instant claims. The lower end of the claimed gel content in Application No. 10/541,391 (2 wt.%) is also very close to the instantly claimed gel content of less than 2 wt.%. As indicated in the rejection above, the claimed methods and products thus appear to be modifications of each other derived from routine experimentation and optimization, such as in the case of the closely related polymerization temperature ranges indicated in either set of claims. Processing

conditions, such as temperature, are routinely adjusted for reasons such as enhancing speed or reducing cost.

**(11) Related Proceeding(s) Appendix**

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Melissa Winkler/

Examiner, Art Unit 1796

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/James J. Seidleck/

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